

*Prelim.*  
*DRAFT*  
*am*

**A PROPOSAL TO SUSPEND  
GROUNDWATER AND SOIL TREATMENT SYSTEM  
OPERATION**

**AND COMMENCE POST-SHUTDOWN GROUNDWATER  
MONITORING AT THE GRANVILLE SOLVENTS SITE,  
GRANVILLE, OHIO**

EPA Region 5 Records Ctr.



379596

**Prepared for:**

Baker & Hostetler, LLP  
On Behalf Of  
The Granville Solvents Site Response Management Group, LLC  
Capitol Square, 65 East State Street  
Columbus, Ohio 43215

**Prepared by:**



**Metcalf & Eddy of Ohio, Inc.  
2800 Corporate Exchange Drive, Suite 250  
Columbus, Ohio 43231**

**August 2004**

## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
2.0	SITE CONDITIONS.....	2
2.1	Historical Summary .....	2
2.2	Groundwater Quality .....	2
2.3	Source Area Soils.....	4
2.4	Response Action Objectives. ....	4
2.5	Current Site Conditions.....	5
2.5.1	Groundwater .....	5
2.5.2	Source Area Soils.....	8
3.0	SUSPENSION OF TREATMENT SYSTEM OPERATIONS .....	10
3.1	Groundwater Extraction and Treatment System.....	10
3.1.1	Suspension of Groundwater Extraction and Treatment System Operation.....	10
3.1.2	Post Shutdown Monitoring .....	10
3.2	Soil Response Action.....	11
3.2.1	Suspension of Soil Treatment System Operation .....	11
3.2.2	Post Shutdown Monitoring .....	12
4.0	POST-SHUTDOWN DOCUMENTATION .....	13
5.0	CONTINGENCY PLAN .....	14

## LIST OF TABLES

Table 1	May 1996 – Groundwater Monitoring Results .....	3
Table 2	May 2004 – Groundwater Monitoring Results .....	7

Table 3	January 2002 – SVE System Discharge Summa Canister Results .....	8
Table 4	June 2004 – SVE System Discharge Summa Canister Results .....	8

## LIST OF FIGURES

Figure 1	TCE Plume, 1996.....
Figure 2	PCE Plume, 1996.....
Figure 3	TCA Plume, 1996 .....
Figure 4	TCE Plume, 2004.....
Figure 5	PCE Plume, 2004.....
Figure 6	TCA Plume, 2004 .....
Figure 7	TCA Concentrations in Monitoring Wells.....
Figure 8	TCE Concentrations in Monitoring Wells .....
Figure 9	PCE Concentrations in Monitoring Wells .....
Figure 10	Groundwater VOC Removal.....
Figure 11	Estimated Soil Mass Removal based on SUMMA sampling .....

## Attachment 1

Groundwater Monitoring Report 2003

## 1.0 INTRODUCTION

An Administrative Order on Consent (AOC) between the U.S. EPA and the Granville Solvents Site Management Group, LLC (the "Group") (September 1994) required completion of certain Removal Actions at the Granville Solvents Site (the "Site") in Granville, Ohio. Those Removal Actions included installation of a groundwater extraction and treatment system to halt migration of contaminated groundwater toward the Village of Granville (the "Village") municipal well field and reduce the level of contaminants in groundwater; reinstate the capacity of the Village's groundwater production (PW-1); and, treatment of Site soils so that groundwater beneath the soils will not become contaminated above the groundwater "no further action" levels as defined in Engineering Evaluation/Cost Analysis (EE/CA). The Group has completed the following Removal Actions at the Site:

1. Installation and operation of a groundwater extraction and treatment system that has operated on a continuous basis since startup in December 1994. This system has halted migration of groundwater contamination from the Site, continues to reduce the mass and size of the plume and meets the obligations established in the AOC.
2. Village production well PW-4 was installed in the adjacent Village well field to reinstate the capacity of the Village former production well, PW-1.
3. A soil treatment system, consisting of soil vapor extraction, air injection, and air sparging in the saturated zone (SVE/AI/AS) was installed and has been in operation since 2001. Soils beneath the Site meet the required levels established in the approved Engineering Evaluation/Cost Analysis (EE/CA) August 1999.

Based on the groundwater quality and soil data collected during the past 10 years of operation of the groundwater and soil treatment systems, the Group has achieved the cleanup criteria in the groundwater at the compliance zone, in the groundwater beneath the source area, and in the soil in the source area. Consistent with the current conditions and an evaluation of 10 years of operating data, the Group proposes to suspend groundwater and soil treatment and undertake a post-shutdown groundwater monitoring program with the approval of U.S. EPA. The Group commits to operate and maintain the groundwater and soil treatment systems until U.S. EPA is satisfied that compliance with remedial goals and objectives has been demonstrated.

The purpose of this project is to evaluate the hydrogeologic conditions during suspension of active groundwater extraction and soil treatment. Ultimately, this effort will provide the information necessary for site close-out. This proposal describes current site conditions (Section 2), actions that will be taken during the transition to shutdown (Section 3) and documentation for the shutdown (Section 4).

## **2.0 SITE CONDITIONS**

### **2.1 Historical Summary**

In December 1994, a groundwater extraction and treatment system was installed to halt migration of contaminants from the Site towards the village of Granville's well field. In addition, the groundwater extraction and treatment system was selected as the most appropriate technology to remediate groundwater contamination at the site. To aid in documenting the performance of the system, the Group implemented a Groundwater Monitoring Program (June 1995). Additional groundwater monitoring wells were installed and sampled in December 1995, and January 1996. The sampling results were reported to U.S. EPA in the *Monitoring Well Installation Report*, September 1996, and appended in December 1996. Groundwater monitoring has been conducted at the Site following the approved plan since that time. A summary of groundwater monitoring results since the system was installed is provided in Attachment 1 (Groundwater Monitoring Report 2003).

### **2.2 Groundwater Quality**

In 1996, baseline concentrations of trichloroethene (TCE) were: 1,400 µg/L in monitoring well MW-P1, 590 µg/L in MW-2D, and 280 µg/L in MW-4D (Table 1). Baseline concentrations of tetrachloroethene (PCE) beneath the source area were: 540 µg/L in MW-P1, 430 µg/L in MW-2D, and 110 µg/L in MW-4D (Figure 2); whereas baseline concentrations of 1,1,1-trichloroethane (1,1,1-TCA) beneath the source area were: 720 µg/L in MW-P1, 350 µg/L in MW-2D, and 110 µg/L in MW-4D (Figure 3).

Neither TCE nor PCE were detected in MW-8 near the leading edge of the historical plume (Table 1). However, the degradation product cis-1, 2 DCE was detected in MW-8 at a concentration of 48 µg/L. The chemicals of concern were not detected in monitoring wells (GSS-MW8, GSS-MW9, GSS-MW10 and GSS-MW11) in the compliance zone.

**TABLE 1**  
**May 1996 - Groundwater Monitoring Results, µg/L**

**a. Source Area**

VOCs	Remedial Goals*	MW-1	MW-2D	MW-4D	MW-6	MW-P1
1,1,1-trichloroethane		450J	350	110	380	720
cis-1,2-dichloroethene		ND	250	150	ND	ND
Tetrachloroethene	3,000	74	430	110	ND	540
Trichloroethene	5,000	230	590	280	78	1400
1,1-dichloroethane		ND	ND	27	ND	ND
trans-1,2-dichloroethene		ND	ND	ND	ND	ND
Toluene		ND	ND	ND	ND	ND

**b. Leading Edge**

VOCs	MW-8	MW-7D
1,1,1-trichloroethane	ND	ND
cis-1,2-dichloroethene	48	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND
1,1-dichloroethane	ND	ND
trans-1,2-dichloroethene	4	ND
Toluene	1J	ND

**c. Compliance Zone**

VOCs	Remedial Goal **	GSS-MW8	GSS-MW9	GSS-MW10	GSS-MW14
1,1,1-trichloroethane	200	ND	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND
1,1-dichloroethane	810	ND	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND	ND
Toluene	1,000	ND	ND	ND	ND

\* No other cleanup criteria were established for the source area based on the EE/CA.

\*\* Remedial Goals are equal to the MCLs.

ND - not detected;

D - diluted sample; and

J - estimated concentration

## 2.3 Source Area Soils

In December 1995, a *Design Technical Memorandum for the Remediation of Impacted Soils* (Design Technical Memorandum) was approved by U.S. EPA. The Design Technical Memorandum outlined an investigation to obtain data for the selection and design of a remedial solution for contaminated Site soils. The investigation was implemented during the spring of 1996, and data were evaluated and presented to U.S. EPA in the *Soil Data Report* (September 1996 / December 1996). In December 1996, a groundwater flow model and contaminant fate and transport model were developed to aid in the determination of soil treatment requirements. The results of that study, forwarded to U.S. EPA in the *Groundwater Flow and Contaminant Fate and Transport Model Report (1996 and 1998 Revision)*, were used to evaluate the level of treatment required to maintain the chemicals of concern in groundwater at the compliance zone below their respective MCLs.

Based on this work, the Group developed the EE/CA in August 1999. The EE/CA included a Streamlined Risk Evaluation that demonstrated that soil treatment goals for both chlorinated and non-chlorinated volatile organic compounds (VOCs) in soil do not pose an unacceptable risk to individuals who may be employed on the site or perform excavation work on the site in the future. For most of the chemicals of concern, maximum concentrations detected in soil were lower than the derived soil treatment goals. Estimated risks associated with the maximum concentrations detected in soil were within the acceptable range for commercial/industrial use of the property and excavation worker potential exposure. Surface soils to a depth of six feet (bgs) were determined to meet residential criteria.

Treatment of soil based on estimated risks from direct contact was not supported by the results of this streamlined risk assessment. The exclusive purpose of soil treatment was to achieve the no further action levels in soils in the source area for the chemicals of concern in groundwater. As specified in the EE/CA, soil treatment criteria were established for TCE and PCE at 6,670 µg/kg and 5,530 µg/kg, respectively.

Cleanup goals defined in the EE/CA were approved by U.S. EPA in October 1999<sup>1</sup>, and placed into the administrative record by reference<sup>2</sup>. In its enforcement memorandum, U.S. EPA approved the goals and objectives of the Removal Action.

## 2.4 Response Action Objectives

Using approved project documents, such as the EE/CA, certain criteria have been established in the administrative record to document the Site removal actions. These criteria are:

1. The groundwater compliance zone where the groundwater no further action levels apply is GSS-EW1<sup>3</sup>.

---

<sup>1</sup> U.S. EPA, Letter to Ben L. Pfefferle, III from Sirtaj Ahmed, October 14, 1999

<sup>2</sup> U.S. EPA, Enforcement Action Memorandum, March 8, 2000

2. The groundwater no further action levels are federal drinking water maximum contaminant levels (MCLs) for the chemicals of concern<sup>4</sup> measured at the point of compliance.
3. The soil exposure standard at the Site is the risk-based standards for direct exposure for commercial/industrial and excavation workers<sup>2</sup>.
4. The soil treatment goals have been established to protect groundwater such that groundwater underlying at the compliance zone will not exceed MCLs<sup>5</sup>.

Using the four criteria above, the Group determined the Response Action Objectives for the Site to be:

1. Prevention of contaminated groundwater exceeding MCLs from migrating beyond the compliance zone (extraction well GSS-EW1) and toward the Village's municipal well field.
2. Reduction of groundwater contamination so that that MCLs are not exceeded beyond the compliance zone. The cleanup criteria for groundwater immediately beneath the source area are 3,000 µg/L for PCE and 5,000 µg/L for TCE. These concentrations predicted no exceedence of the MCL at the compliance zone<sup>6</sup>.
3. Treatment of groundwater extracted from the aquifer and the discharged effluent (to Raccoon Creek) in compliance with applicable standards.
4. Treatment of site soils to assure that concentrations of the 19 chemicals of concern<sup>7</sup> do not exceed MCLs in the groundwater at the compliance zone. Only TCE and PCE initially exceeded their treatment goals of 6.67 mg/kg and 5.53 mg/kg, respectively.

## 2.5 Current Site Conditions

### 2.5.1 Groundwater

The groundwater extraction and treatment system for the Granville Solvents Site was placed in service on December 20, 1994. The system consists of two groundwater extraction wells, one near the former operations building (GSS-EW2) and one near the Village of Granville's water plant (GSS-EW1). Groundwater extracted from these wells is pumped to the treatment building where it first enters a surge tank, is subsequently filtered

---

<sup>1</sup> Engineering Evaluation / Cost Analysis (EE/CA), August 1999, Section 3.4

<sup>2</sup> EE/CA, August 1999, Section 2.5.6, Page 93, Table 2-14.2.5

<sup>3</sup> Groundwater Flow and Contaminant Fate / Transport Model Report; 1999, and EE/CA, Section 2.5.6).

<sup>4</sup> Engineering Evaluation / Cost Analysis, August 1999, Section 2.5.6, Page 100.

<sup>5</sup> Engineering Evaluation / Cost Analysis, August 1999, Section 3.3, Page 109, Table 3-1.

to remove suspended particulates, and into a Shallow Tray® aeration system. The Shallow Tray® system transfers VOCs in the groundwater to the air which is discharged to the atmosphere pursuant to an agreement with U.S. EPA. The treated groundwater is discharged to Raccoon Creek, pursuant to an agreement with Ohio EPA and approved by U.S. EPA. Since operations began, the system has successfully treated all extracted groundwater to below the discharge criteria through the full period of operation, recording no exceedences of agreed discharge criteria.

Beginning in October 2003, the operation of the system was modified to improve performance of the groundwater extraction system. EW-1 was shut down (remains available for restarting) and pumping from EW-2 was increased. Whereas the two wells working together had pumped an average of 250 gallons per minute (gpm), EW-2 is now pumped at an average rate of 270 gpm. This change was approved by U.S. EPA prior to the modification and the results were detailed in a letter to U.S. EPA on January 31, 2004. The modification dramatically improved the efficiency of the system by removing more highly impacted groundwater from the area under the former facility.

Table 2 lists the current concentrations of the chemicals of concern. No chemicals of concern were detected in the compliance zone (Table 2). There are no detectible concentrations of the chemicals of concern in the leading edge monitoring wells with the exception of cis-1,2-dichloroethene (56 µg/L), a common degradation product of tetrachlorethene and trichloroethene, detected in MW-8. The cis-1,2-DCE is below the U.S. EPA approved removal action goal of 70 µg/L. The current concentrations of chemicals of concern in the source area are as follows:

Vc?

- Current concentrations of TCE beneath the source area (Figure 4) include: 55 µg/L in MW-P1 (compared to 1,400 µg/L in 1996), 34 µg/L in MW-2D (590 µg/L in 1996), and 73 µg/L in MW-4D (280 µg/L in 1996).
- Concentrations of PCE beneath the source area (Figure 5) include: 53 µg/L in MW-P1 (540 µg/L in 1996), 68 µg/L in MW-2D (430 µg/L in 1996), and 41 µg/L (110 in 1996) in MW-4D.
- 1, 1, 1-TCA concentrations beneath the source area (Figure 6) include: 160 µg/L in MW-P1 (720 µg/L in 1996), 17 µg/L in MW-2D (350 µg/L in 1996), and 23 µg/L in MW-4D (110 in 1996).
- The concentrations of the other chemicals of concern in the source area are listed in Table 2.

None of the chemicals of concern have been detected in the compliance zone in monitoring wells GSS-MW8, GSS-MW9, GSS-MW10, or GSS-MW14 (Attachment 1). These results demonstrate compliance with the removal action goals in the source area and at the compliance zone and demonstrate that the groundwater and soil treatment systems can be terminated. A comparison of the concentration of compounds in representative monitoring wells over time is illustrated in Figures 7, 8, and 9. The total mass removed from the groundwater over time is illustrated on Figure 10.

TABLE 2

**May 2004 - Groundwater Monitoring Results, µg/L**

**a. Source Area**

VOCs	Remedial Goal*	MW-1	MW-2D	MW-4D	MW-6	MW-P1
1,1,1-trichloroethane		140	17 D	23	180 D	160
cis-1,2-dichloroethene		ND	6.6 D	26	ND	ND
Tetrachloroethene*	3,000	14	68 D	41	ND	53
Trichloroethene*	5,000	40	34 D	73	10 D	55
1,1-dichloroethane		ND	ND	8.2	ND	ND
trans-1,2-dichloroethene		ND	ND	0.79J	ND	ND
Toluene		ND	ND	ND	ND	ND

**b. Leading Edge**

VOCs	MW-8	MW-7D
1,1,1-trichloroethane	ND	ND
cis-1,2-dichloroethene	46 D	ND
Tetrachloroethene	ND	ND
Trichloroethene	ND	ND
1,1-dichloroethane	ND	ND
trans-1,2-dichloroethene	ND	ND
Toluene	ND	ND

**c. Compliance Zone**

VOCs	Remedial Goal **	GSS-MW8	GSS-MW9	GSS-MW10	GSS-MW14
1,1,1-trichloroethane	200	ND	ND	ND	ND
cis-1,2-dichloroethene	70	ND	ND	ND	ND
Tetrachloroethene	5	ND	ND	ND	ND
Trichloroethene	5	ND	ND	ND	ND
1,1-dichloroethane	810	ND	ND	ND	ND
trans-1,2-dichloroethene	100	ND	ND	ND	ND
Toluene	1,000	ND	ND	ND	0.31 J

\* No other cleanup criteria were established for the source area based on the EE/CA.

\*\* Remedial Goals are equal to the MCLs.

ND – not detected;

D – diluted sample; and

J – estimated concentration

### 2.5.2 Source Area Soils

The Soil Removal Action included air injection, soil vapor extraction, and air sparging. The treatment system began operation in December 2001. Compounds detected in initial samples collected in summa canisters are listed in Table 3.

**TABLE 3**  
**September 2001 – SVE System Discharge Summa Canister Results (detections only)**

<b>Compound</b>	<b>Concentration (ppmv)</b>	<b>Concentration (<math>\mu\text{g}/\text{m}^3</math>)</b>
Tetrachloroethene	7.1	48000
Trichloroethene	3.9	21000
1,1,1-Trichloroethane	4.8	26000
cis-1,2-Dichloroethene	0.1	440
<b>Total VOCs</b>	<b>15.9</b>	<b>95440</b>

ppmv – parts per million by volume

Approximately 334 pounds of VOCs have been removed by the SVE system since start-up began in 2001. Original estimates of the mass prior to system installation indicated that up to 195 pounds of TCE and PCE might be present in the subsurface soils.

The current analytical data from samples collected using SUMMA canisters for the chemicals of concern are listed in Table 4. Based on such data, the mass removed from the soil over time is illustrated on Figure 11.

**TABLE 4**  
**June 2004 – SVE System Discharge Summa Canister Results (detections only)**

<b>Compound</b>	<b>Concentration (ppmv)</b>	<b>Concentration (<math>\mu\text{g}/\text{m}^3</math>)</b>
Tetrachloroethene	0.200	1356
Trichloroethene	0.280	1504
1,1,1-Trichloroethane	0.520	2839
cis-1,2-Dichloroethene	0.009	35.73
<b>Total VOCs</b>	<b>1.009</b>	<b>5735</b>

ppmv – parts per million by volume

The data shows that more mass has been removed than initially estimated to be present. Air monitoring of the off gas from the SVE system demonstrates that the rate of VOC removal has dropped to 6% of the initial rate . This demonstrates that residual mass in the soil is likely to be below the cleanup goals established for the chemicals of concern. The reduced effectiveness of VOC recovery from the SVE system supports the decision to suspend operation of the soil treatment components. Accordingly, operation of the soil treatment system can be suspended without increasing the risk of further contaminating groundwater. The soil treatment system will be maintained in “standby” condition until such time as U.S. EPA is satisfied that soil treatment goals have been demonstrated.

### **3.0 SUSPENSION OF TREATMENT SYSTEM OPERATIONS**

#### **3.1 Groundwater Extraction and Treatment System**

Monitoring of groundwater for over 10 years has demonstrated uninterrupted compliance with the AOC and that the leading edge of the plume has been drawn back towards the source area almost 300 feet and is now located approximately 450 feet east of the compliance zone. Concentrations of the chemicals of concern in groundwater have been substantially reduced from their original concentration and have consistently been below the removal action criteria approved by U.S. EPA. Data collected during operation of the Soil Treatment System, including the estimated mass removed from the soil, demonstrates that the soil treatment goals have been achieved.

##### **3.1.1 Suspension of Groundwater Extraction and Treatment System Operation**

The groundwater extraction and treatment system will be shut down with the concurrence of the U.S. EPA. The termination process will contain three components:

1. Post-shutdown monitoring;
2. Shutdown evaluation and documentation; and
3. Contingency plan.

Following shutdown, monitoring will occur to ensure that criteria continue to be met and to collect data to be evaluated regarding the attenuation of the plume.

##### **3.1.2 Post-Shutdown Monitoring**

Once the system is shut down, the aquifer will likely be influenced by pumping in the Village well field and natural hydrogeologic conditions. Observation of the aquifer during this time will result in a better understanding of the groundwater flow conditions and plume migration patterns. Using values documented in the *Groundwater Flow and Contaminant Fate and Transport Model Report*, 1997, contaminant plume velocity is estimated to be 0.09 feet/day (34 feet/year), a relatively slow rate of movement. As such, groundwater monitoring will be sufficient to document any plume regeneration and allow adequate time to safely determine if it is necessary to implement a contingency plan to restart the extraction system.

The post-shutdown monitoring network will include the following wells:

1. Compliance Zone wells -
  - GSS-EW1
2. Intermediate zone wells -
  - MW-8;
  - MW-7D;

- GSS-MW15 (new well)
3. Source area wells –

- MW-6
- MW-2D;
- MW-P1; and
- MW-4D.

One new well, GSS-MW15, will be installed about 100 feet west of MW-6 and MW-2D to define the presence or absence of the chemicals of concern in the area immediately downgradient of those wells and to provide an early warning sentinel for compliance well GSS-EW1. Sampling will be conducted on a semi-annual basis from all wells except for former extraction well GSS-EW1, which will be sampled on an annual basis. Monitoring will continue for 3 years after removal system shutdown. Samples collected will be analyzed for VOCs.

During the first six quarters of the shutdown, groundwater level measurements will be made in the available monitoring wells to document the change on the potentiometric surface following system shutdown. Groundwater levels will be measured coincident with groundwater sampling after that time until the Ground Water Response Action is terminated.

Consideration was given to which wells would be sampled and the frequency of sampling of those wells. The post shutdown monitoring network as described in Section 3.1 was developed based on experience and judgment about potential regeneration of the plume. The Monitoring and Remediation Optimization System (e.g., MAROS) (AFCEE, version 2) will be used to evaluate this monitoring network. Based on these analyses, monitoring wells that are duplicated by proximate wells and wells for which it is determined that analytical data will have no clear use in future decision making, will be abandoned in accordance with Ohio Department of Natural Resources requirements. The Group will notify U.S. EPA prior to abandonment of any wells.

### **3.2 Soil Response Action**

Collected data demonstrates that soil treatment goals have been achieved. Soil sampling conducted in 1996 indicated the presence of certain chemicals in the soil beneath the Site. An estimated total of 85 pounds of TCE and 110 pounds of PCE were present in the area requiring treatment. Summa canister data collected during the operation of the soil treatment system shows that approximately 125 pounds of TCE and 184 pounds of PCE have been removed as of December 31, 2003. (TCE and PCE are the only chemicals of concern that exceeded U.S. EPA approved removal action criteria.) Based on these estimates, over 150 percent of the original mass has been removed.

Air monitoring of the off gas from the SVE system demonstrates that the rate of VOC removal has dropped to 6% of the initial rate. The reduced effectiveness of VOC recovery from the SVE system supports the decision to suspend operation of the soil

treatment components. Accordingly, operation of the soil treatment system can be suspended without increasing the risk of further contaminating groundwater. The soil treatment system will be maintained in “standby” condition until such time as U.S. EPA is satisfied that soil treatment goals have been demonstrated.

### **3.2.1 Suspension of Soil Treatment System Operation**

As indicated above, soils beneath the Site have been treated to required levels such that none of the 19 chemicals of concern will exceed MCLs at the compliance zone. When the groundwater system is terminated, the soil system will also be terminated and four soil samples will be collected by direct push methods in the source area and analyzed for VOCs to verify compliance with soil remedial goals.

### **3.2.2 Post-Shutdown Monitoring**

The exclusive purpose of soil treatment was to achieve the no further action levels for the chemicals of concern in groundwater below the source area. Post-shutdown monitoring will consist of groundwater monitoring described in Section 3.1.2 above to verify that the remaining mass in the soil does not regenerate a plume in groundwater that will cause the U.S. EPA approved standards to be exceeded in the compliance zone.

#### **4.0 POST-SHUTDOWN DATA EVALUATION AND DOCUMENTATION**

Post shutdown monitoring will document any regeneration of the plume in impacted groundwater over time. Because the flow velocities will be relatively low, any regeneration will progress slowly. The rate, magnitude, and direction of any plume regeneration, if it occurs, and transport will be documented to better evaluate the attenuation of the chemicals of concern as they migrate unaffected by the groundwater extraction system. Periodic sampling and measurement of water levels as described in Section 3.1.2 will enable the Group to predict how hydraulic characteristics and groundwater flow will change under varying conditions imposed by Village pumping wells, as well as how the plume will behave (i.e. reconstitution, dispersion, and/or migration).

During the period of post shutdown monitoring, an annual report will be submitted to U.S. EPA that documents the activities described above. The report shall generally follow the outline as described below:

##### **Shutdown Annual Report Outline**

Executive Summary

1. Introduction
2. Shutdown Monitoring Results
3. Contingency Plan Implementation
4. Summary

Tables

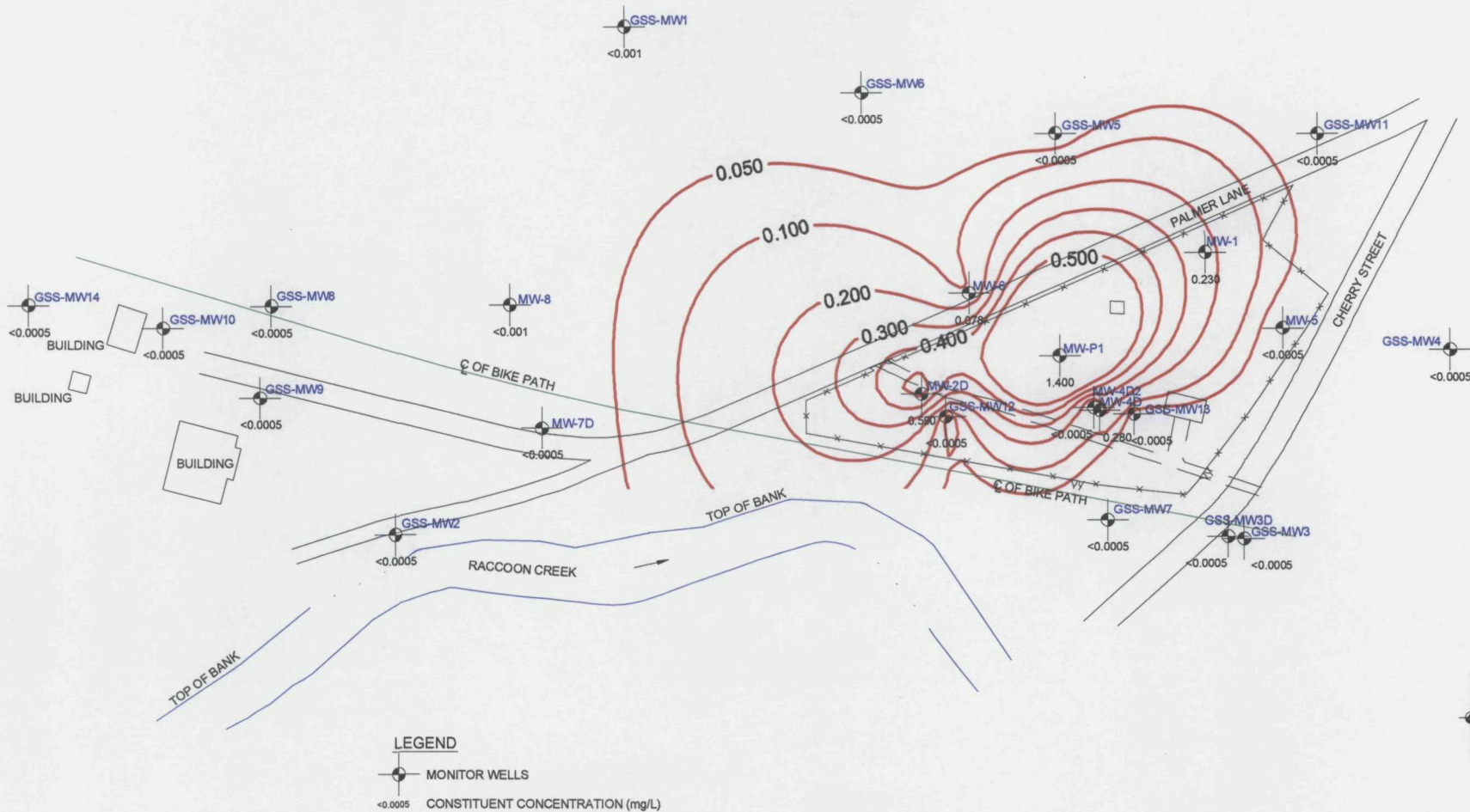
Figures

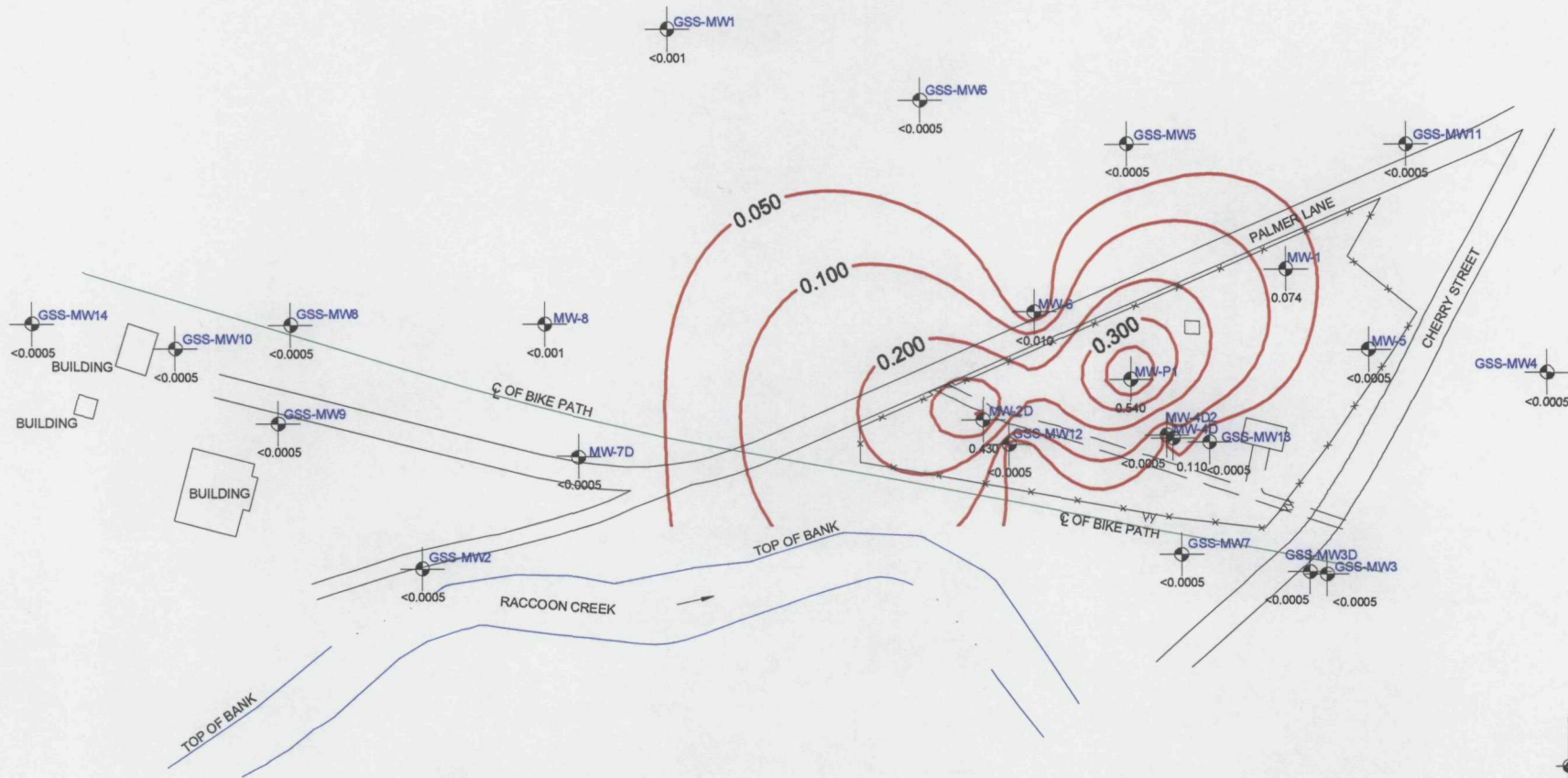
Appendices

## 5.0 CONTINGENCY PLAN



Groundwater will be monitored after shutdown of the system to assure that chemicals of concern do not regenerate a plume that results in an exceedence of MCLs at GSS-EW1. The data collected during the post-shutdown period will be evaluated using statistical methods (e.g. Monitoring and Remediation Optimization System (MAROS) software as discussed in Section 3.1). If the analysis demonstrates that MCLs are expected to be exceeded at GSS-EW1, the Group will provide a contingency plan for EPA approval to reinstate operation of the groundwater extraction system to once again reduce the concentration of chemicals of concern in groundwater such that MCLs are not exceeded in the compliance zone. The system would be operated for a period of time necessary to meet the criteria that demonstrates GSS-EW1, when shut down will not become contaminated above the MCL. This period would be followed by shut-down of the system and resumed post-shutdown monitoring as described above. Depending on the concentration of the chemicals of concern in the extracted groundwater, alternative treatment strategies may be employed at the Group's discretion. If appropriate, the SVE/AI/AS system may be restarted to further reduce the concentration of the chemicals of concern in soil.

This cycle would continue until the chemicals of concern in the groundwater compliance zone no longer exceeds the MCLs during the monitoring period and the concentrations are shown to have peaked and begin to decline.





# LEGEND

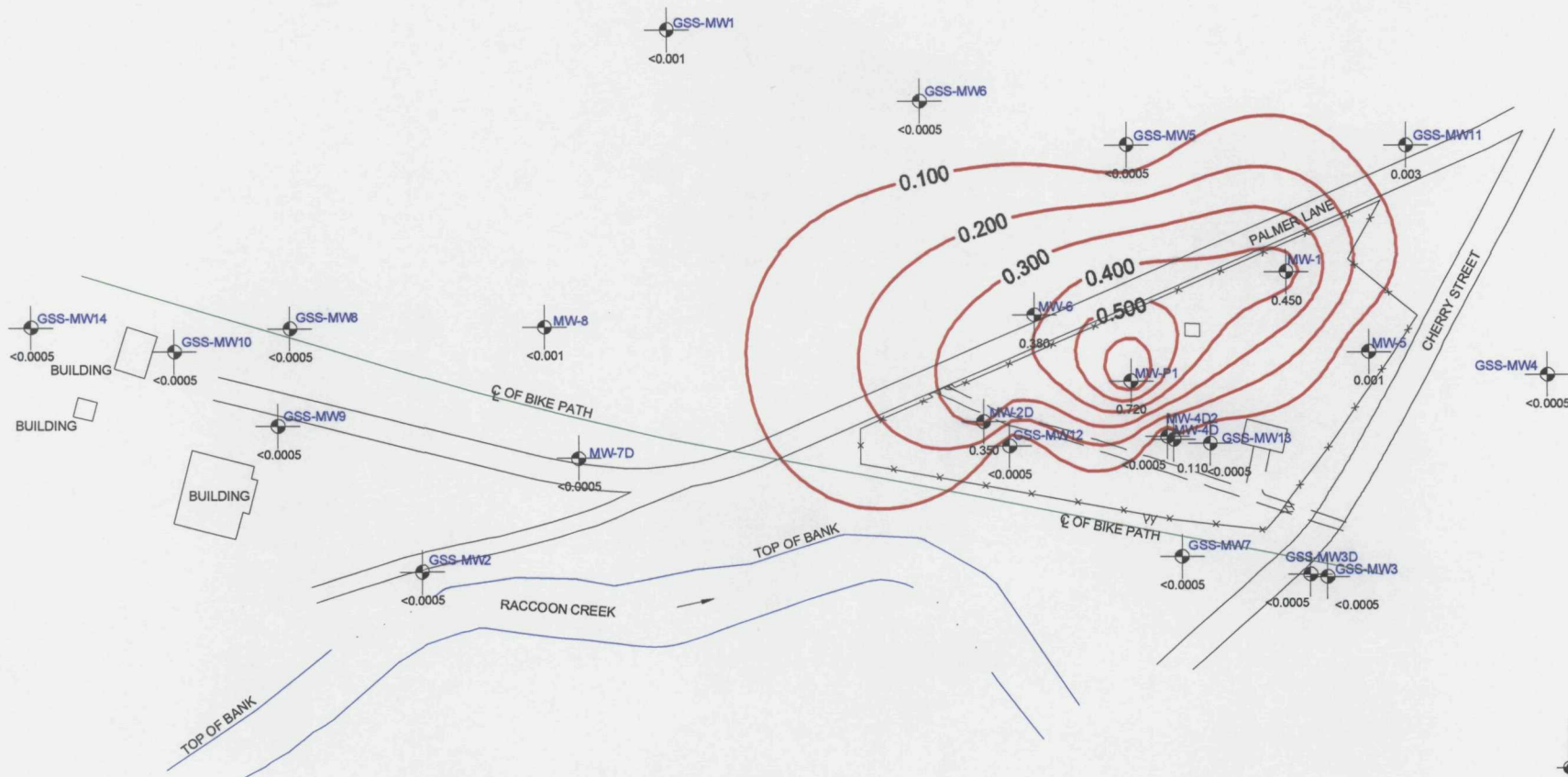
 MONITOR WELLS  
 CONSTITUENT CONCENTRATION (mg/L)

SCALE IN FEET  
 0 75 150

**M&E**  
 Metcalf & Eddy

GRANVILLE SOLVENTS SITE  
 Tetrachloroethene (mg/L)  
 May 1996  
 GRANVILLE, OHIO

Project Number	
100178	
File Name	Figure
GSBASEMAP	Figure 2



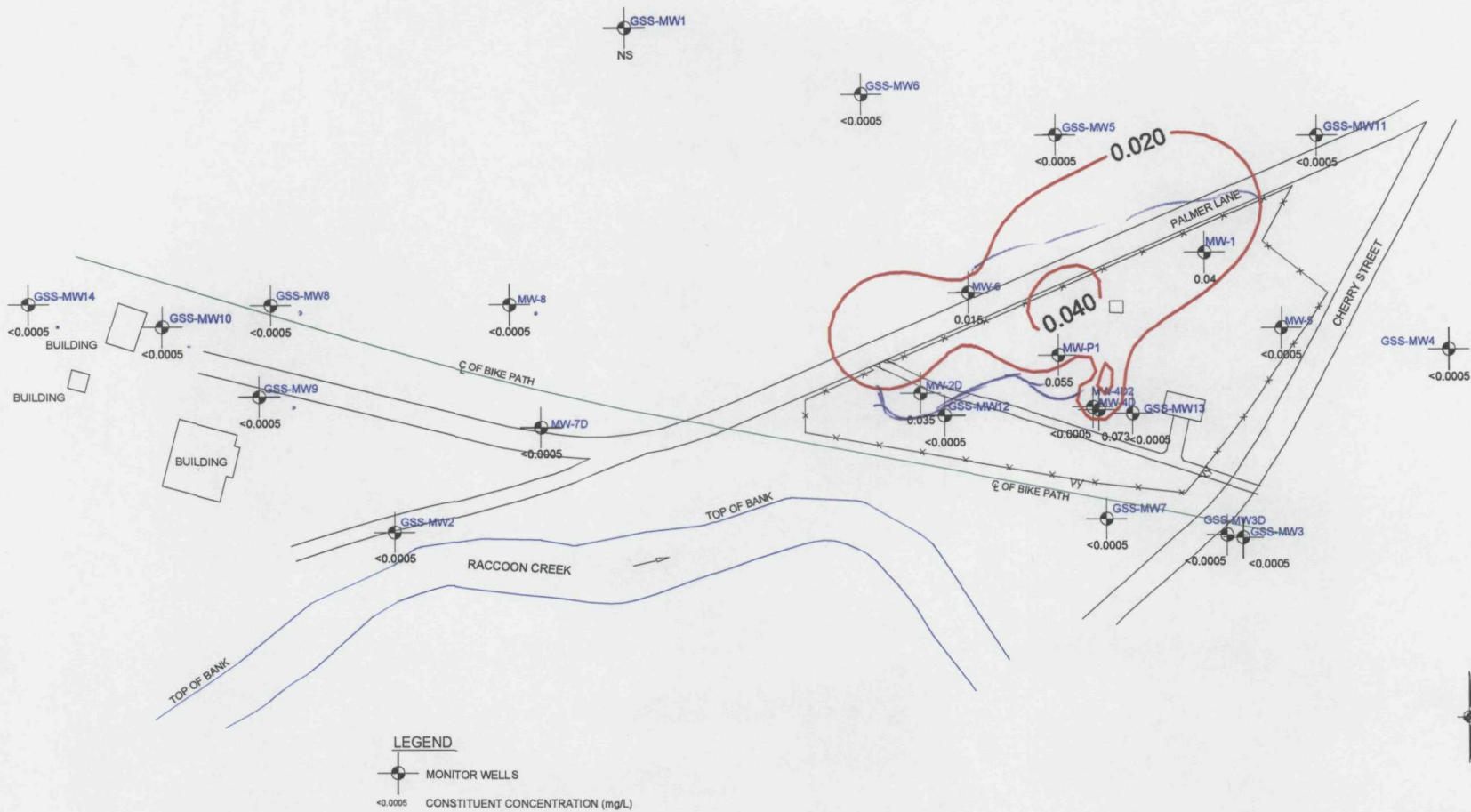
**LEGEND**  
 MONITOR WELLS  
 <0.0005 CONSTITUENT CONCENTRATION (mg/L)

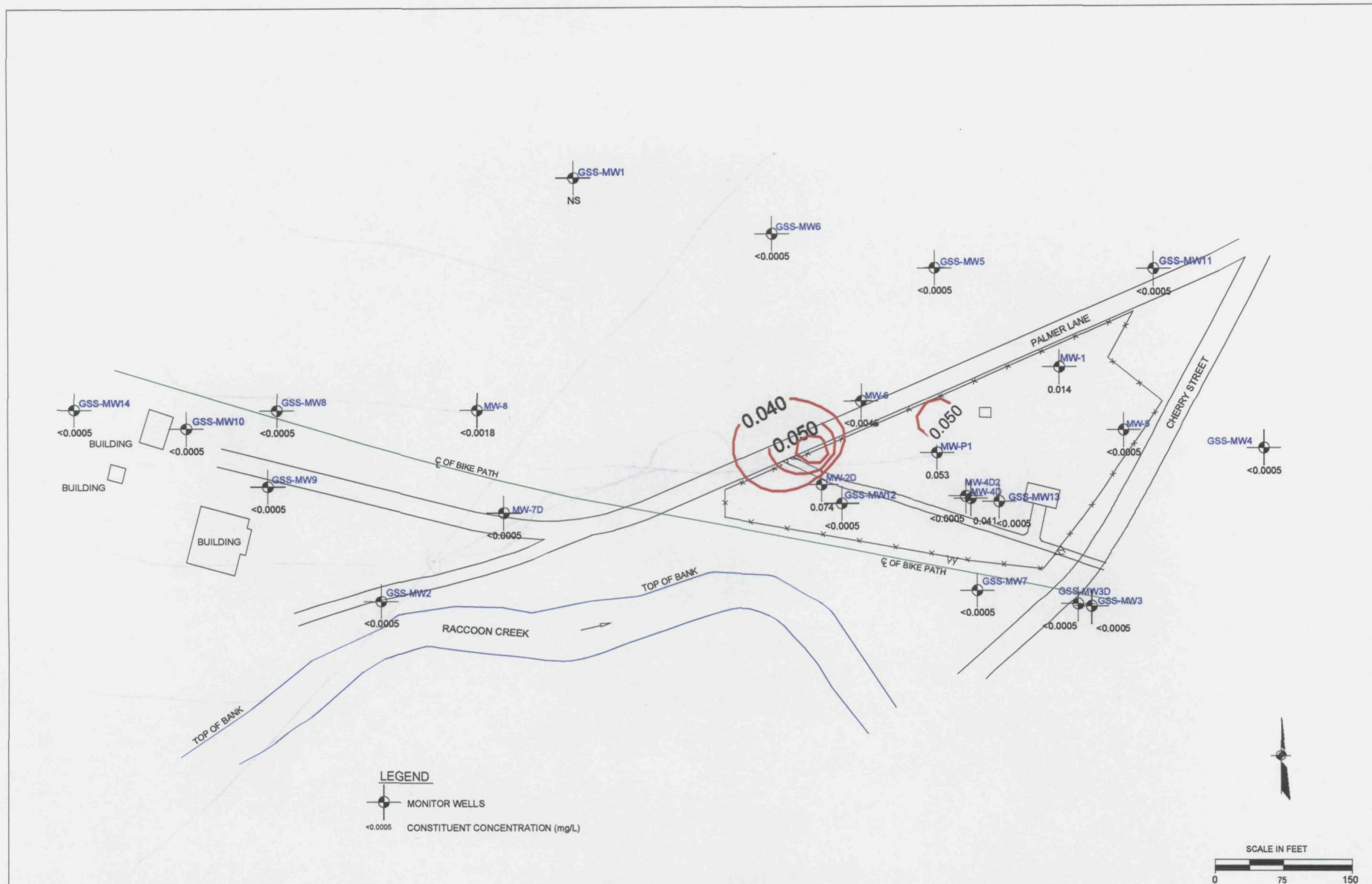
SCALE IN FEET  
 0 75 150

**M&E**  
 Metcalf & Eddy

**GRANVILLE SOLVENTS SITE**  
 1,1,1-Trichloroethane (mg/L)  
 May 1996  
 GRANVILLE, OHIO

Project Number <b>100178</b>	
File Name <b>GSBASEMAP</b>	Figure <b>Figure 3</b>

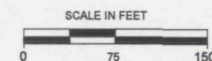
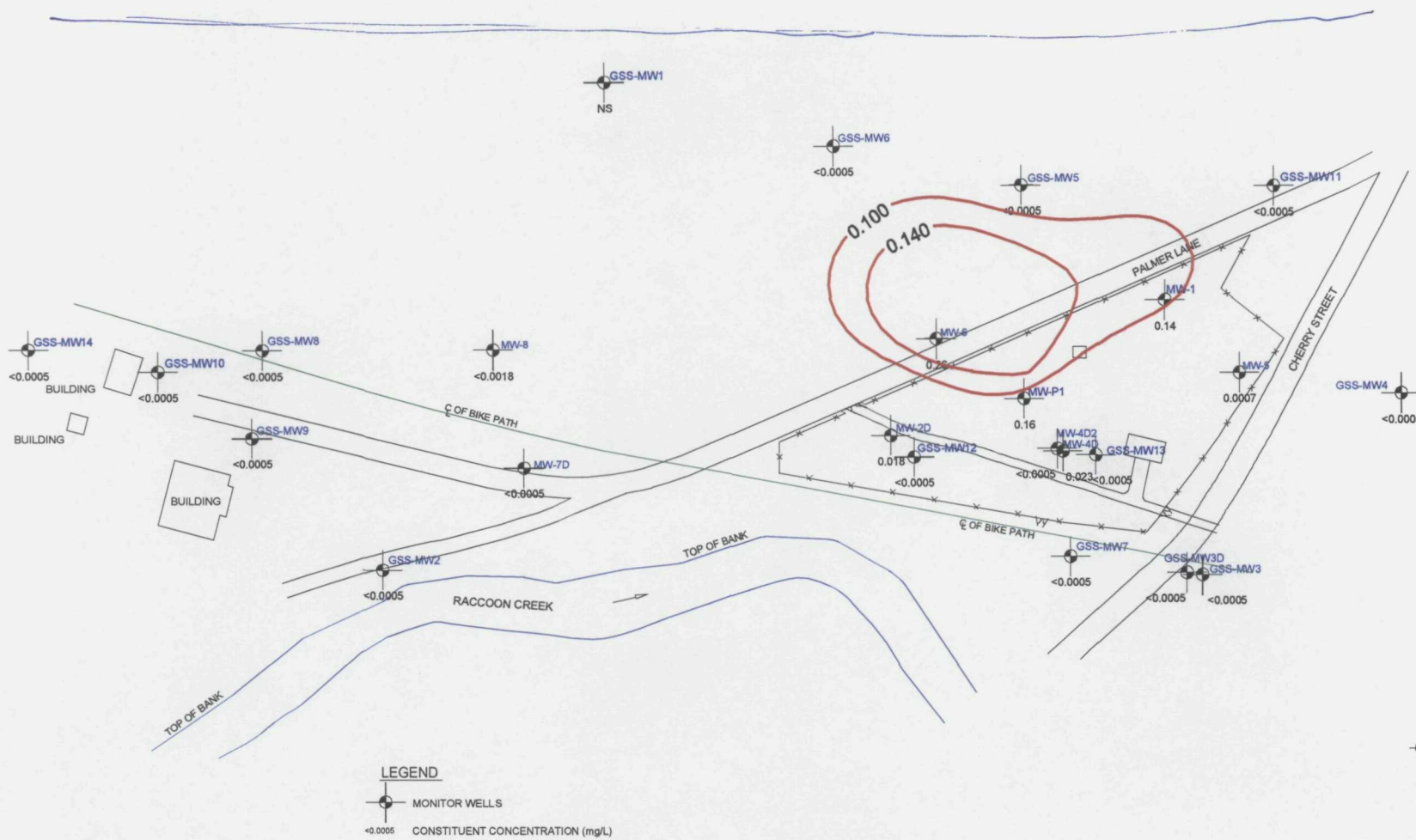




**M&E**  
Metcalf & Eddy

GRANVILLE SOLVENTS SITE  
Tetrachloroethene (mg/L)  
May 2004  
GRANVILLE, OHIO

Project Number <b>100178</b>	
File Name <b>GSBASEMAP</b>	Figure <b>Figure 5</b>



GRANVILLE SOLVENTS SITE  
 1,1,1-Trichloroethane (mg/L)  
 May 2004  
 GRANVILLE, OHIO

Project Number 100178	
File Name GSBASEMAP	Figure Figure 6

Figure 7  
Granville Solvents Site  
1,1,1-TCA Concentration in Monitoring Wells

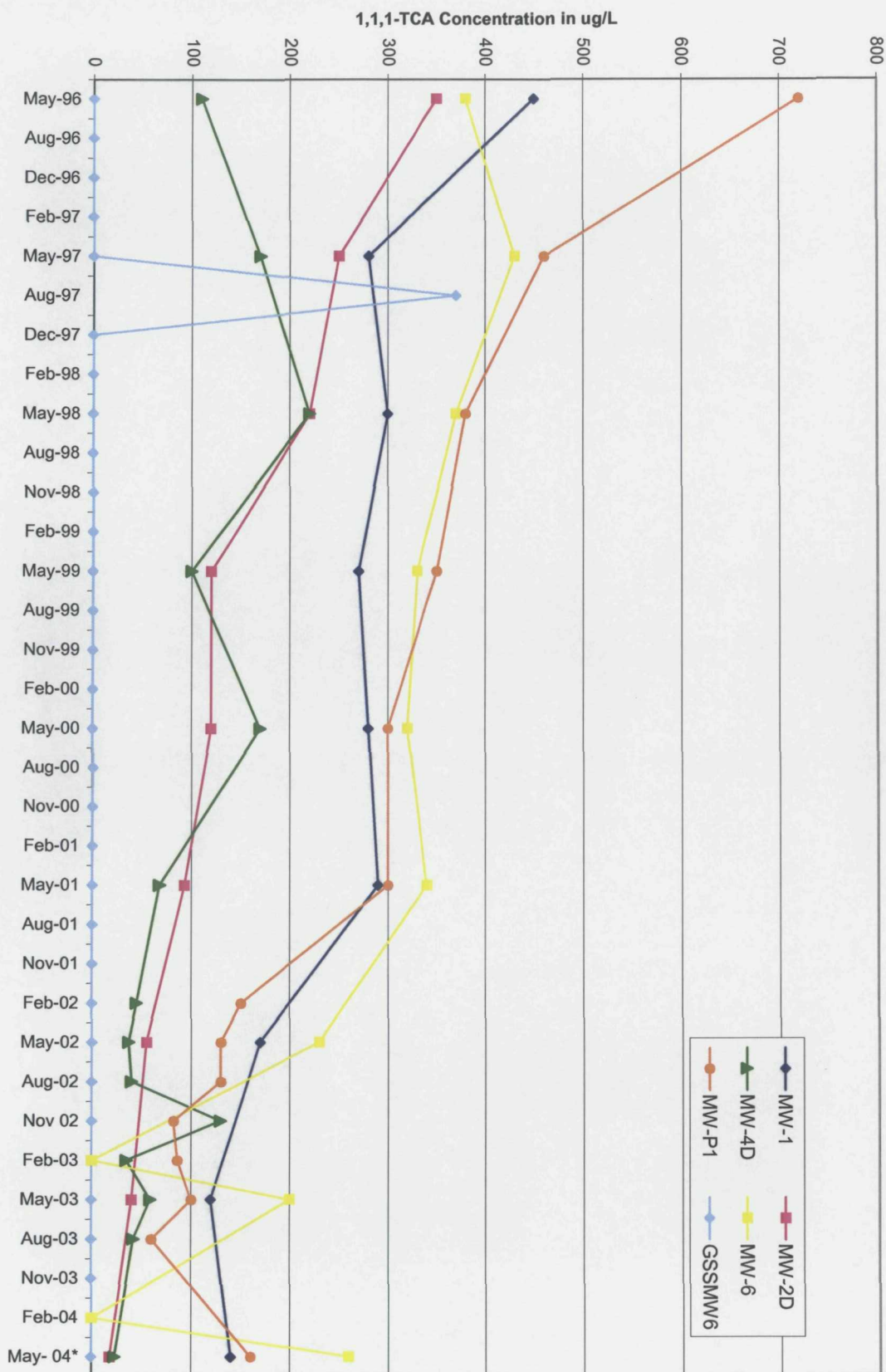


Figure 8  
Granville Solvents Site  
TCE Concentration in Monitoring Wells

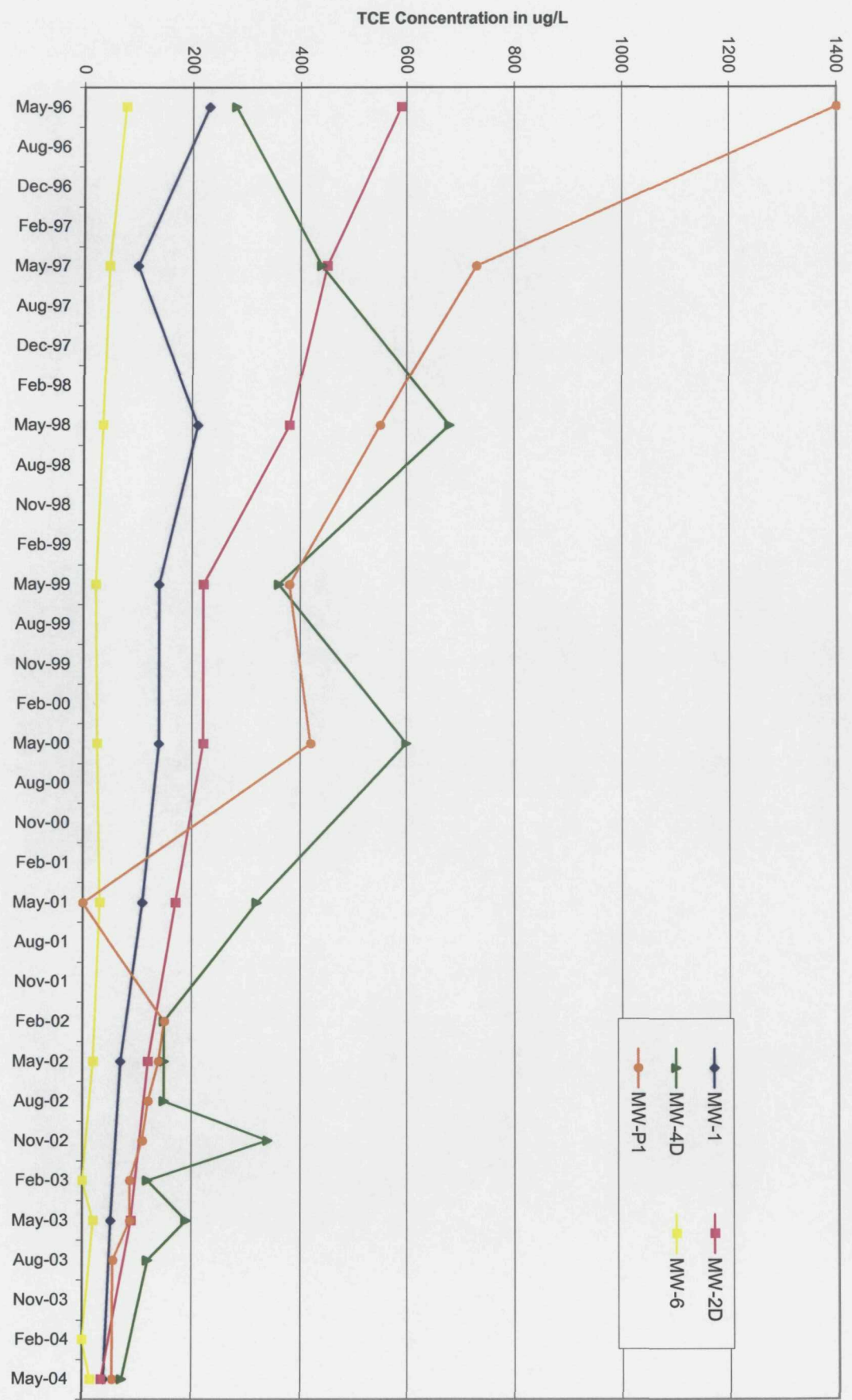


Figure 9  
Granville Solvents Site  
PCE Concentrations in Monitoring Wells

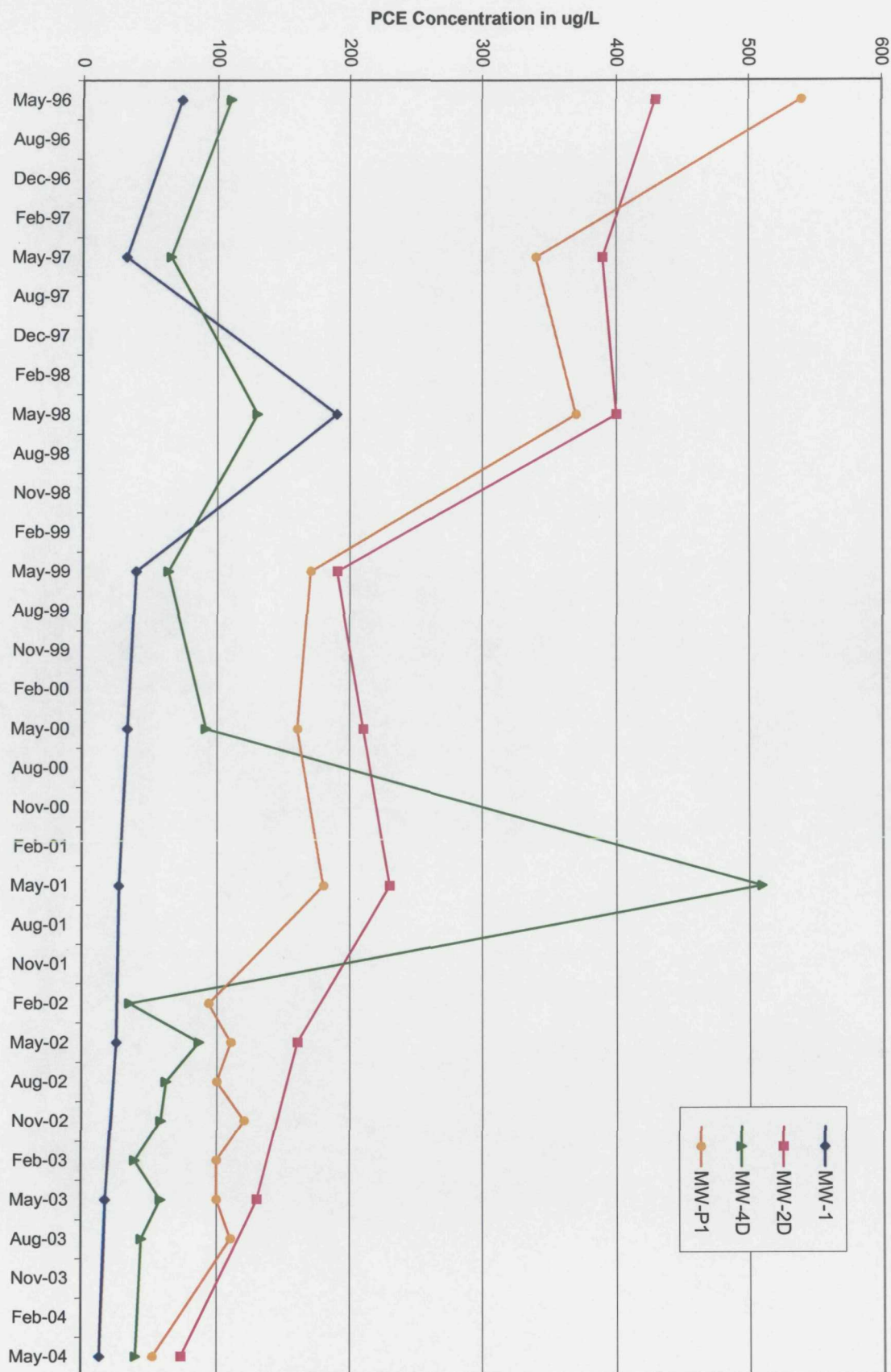
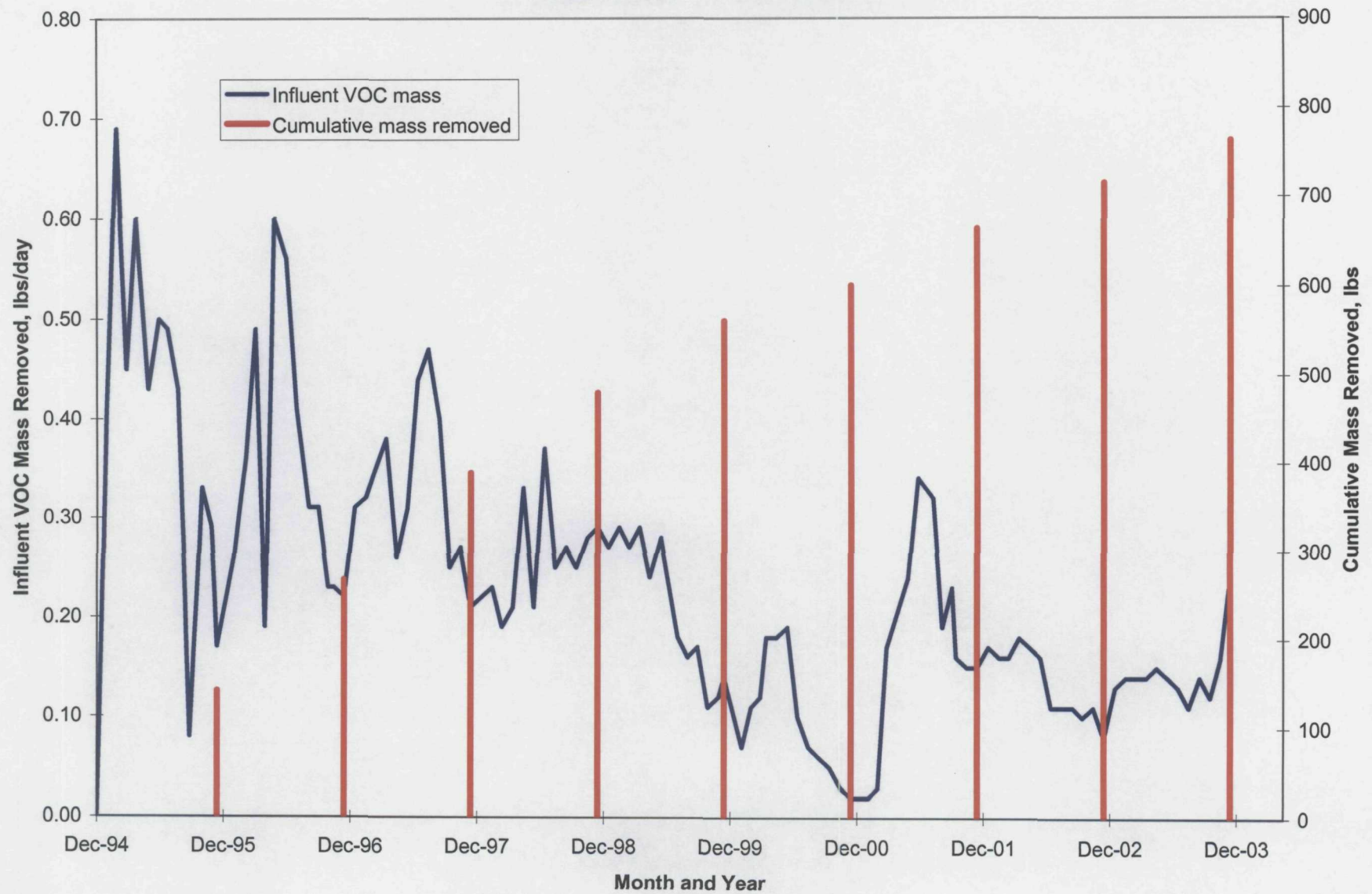


Figure 10  
Granville Solvents Site  
Groundwater VOC Removal



**Figure 11**  
**Granville Solvents Site**  
**Estimated Soil Mass Removal based on SUMMA sampling**

